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WHAT IS CLAIMED IS :

Claim 1. A heart valve prosthesis comprising an annular valve body having a central passageway therethrough designed to be mounted to permit the flow of blood therethrough in a predetermined downstream direction, and

5 P<sub>1</sub> a pair of leaflets which are supported for substantially pivotal movement on eccentric axes between a closed position blocking blood flow through said central passageway and an open position allowing blood flow therethrough in said predetermined downstream direction,

10 P<sub>1</sub> said annular valve body including a pair of substantially diametrically opposed standards extending from a main portion of said body in said predetermined downstream direction,

P<sub>1</sub> said leaflets and said valve body including  
15 projecting guides and complementary depressions which receive said guides,

P<sub>1</sub> said depressions and said projecting guides mounting said leaflets in a manner to allow pivotal movement relative to said annular valve body,

20 P<sub>1</sub> either said depressions or said guides being located at least partially in said standards so that, in the open position, said leaflets are substantially displaced from the spatial region of said main portion of said annular valve body in a direction downstream of the flow of blood  
25 therethrough.

Claim 2. A heart valve in accordance with Claim 1 wherein said guides each have a surface which is a portion

CLAIM 2. continued

of a spheroidal surface and wherein said depressions are formed with a surface of substantially mating curvature.

Claim 3. A heart valve in accordance with Claim 2 wherein said projecting guides are carried by said leaflets and wherein two pairs of said depressions are located in said valve body at least partially in said standards.

Claim 4. A heart valve in accordance with Claim 3 wherein each of said guides has a surface which is generally that of a spherical sector and wherein said depressions are elongated and extend downstream for a distance of at least about 125 percent of the diameter of said spherical sector and at an angle of between 0° and about 45° outward from a line parallel to the centerline of said central passageway.

Claim 5. A heart valve in accordance with Claim 4 wherein said depressions extend in a substantially straight line.

Claim 6. A heart valve in accordance with Claim 1 wherein said leaflets are formed with a pair of substantially planar, substantially parallel lateral surfaces from which said guides protrude.

Claim 7. A heart valve in accordance with Claim 6 wherein said guides are defined partially by a pair of substantially parallel side surfaces which are substantially perpendicular to said leaflet lateral surfaces.

Claim 8. A heart valve in accordance with Claim 7 wherein said guides each include an end surface of generally spherical curvature.

Claim 9. A heart valve in accordance with Claim 7 wherein said guides each include a flat end surface having rounded edges.

Claim 10. A heart valve in accordance with either  
claim 8 or 9 wherein said depressions each have a surface  
outline of the general shape of a pie-shaped circular sector  
with the apex of said sector located nearest the centerline  
5 of said central passageway.

Claim 11. A heart valve in accordance with claim 1  
wherein said depressions are substantially larger in volume  
than the volume of said guides and wherein there is  
communication between said depressions and the bloodstream  
5 both downstream and upstream of said leaflets so that a  
controlled backflow of blood through said depressions occurs  
during the time said leaflets are in the closed position.

Claim 12. A heart valve in accordance with claim 11  
wherein said depressions are formed in a pair of opposed  
flat interior surfaces of said annular valve body and  
wherein a groove is provided in said flat surfaces between  
5 each of said depressions and the central valve body  
passageway upstream of said leaflets.

Claim 13. A heart valve in accordance with claim 1  
wherein each of said leaflets has a downstream edge which is  
substantially semicircular and wherein said valve body is  
formed with annular seat means having a downstream-facing  
5 surface against which said leaflet downstream edges abut in  
closed position.

Claim 14. A heart valve prosthesis comprising an  
annular valve body having a central passageway therethrough  
which is designed to be mounted to permit the flow of blood  
therethrough in a predetermined downstream direction, and

Claim 14 continued.

5 a pair of leaflets which are supported upon said  
annular valve body for substantially pivotal movement on  
eccentric axes between a closed position blocking blood flow  
through said central passageway and an open position  
allowing blood flow therethrough in said predetermined  
10 downstream direction.

said leaflets each including a major body portion  
which is a section of a tube having a curved sidewall and  
being mounted with their concave surfaces facing each other,  
said axes being located substantially upstream of the center  
15 of gravity of said leaflets when said leaflets are in the  
open position.

Claim 15. A heart valve in accordance with Claim 14  
wherein said leaflets and said valve body include projecting  
guides and depressions which pivotally receive said guides.

Claim 16. A heart valve prosthesis comprising an  
annular valve body having a central passageway therethrough  
of substantially circular cross section which valve body is  
designed to be mounted to permit the flow of blood  
5 therethrough in a predetermined downstream direction, said  
valve body having seat means formed by a surface facing  
generally <sup>downstream</sup> downstream, and

a P a pair of leaflets which are supported upon said  
annular valve body for substantially pivotal movement on  
10 parallel eccentric axes between a closed position blocking  
blood flow through said central passageway and an open  
position allowing blood flow therethrough in said  
predetermined downstream direction,

<sup>16</sup>  
Claim 16 continued

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15 said leaflets each including a major body portion  
which is a section of a tube having an elliptical cross  
section and said leaflets being mounted with their concave  
surfaces facing each other, the curvature of said elliptical  
tubular section being chosen and said axes being located  
such that the downstream edge of each of said leaflets is  
20 substantially semi-circular, said downstream edge having a  
radius of curvature less than that of said seat means  
surface, whereby the curved edge of the leaflet in the  
closed position forms line contact with said seat surface  
and provides a close seal therewith.

<sup>17</sup>  
Claim 17. A heart valve in accordance with <sup>16</sup>claim 16  
wherein said leaflets and said valve body include projecting  
guides and depressions which pivotally receive said guides.

<sup>18</sup>  
Claim 18. A heart valve in accordance with <sup>17</sup>claim 17  
wherein said elliptical cross section is that of a 10° to  
20° ellipse. <sup>B</sup>

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